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ABSTRACT

Indicators of education status and trends for higher education are proposed to engender thought and comment from those who would be the primary users of such a set of indicators. Types of indicators and approaches to constructing them are considered. Indicators describe significant aspects of the system of education with particular emphasis on policy-relevant aspects. Indicators also monitor trends and changes over time, and the data underlying the indicators must be reliable and valid. Data must be converted into indicators in ways that are considered appropriate and acceptable by intended users, presumably state and national policymakers and an informed general public. Indicators have been described by NCES in terms of outcomes, resources, and context. Of concern are student outcomes, discipline/knowledge or research outcomes, economic/societal outcomes, and civic/societal outcomes. Resources can be categorized as follows: institutions, programs and curricula, financial resources, human resources, and physical resources. Additional indicators are the demographic, economic, and political contexts. Ways to calculate each indicator are discussed. The adequacy of current data collection is also adressed. A three-page list of references is included. (SW)

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FOR REVIEW PURPOSES ONLY

INDICATORS OF THE CONDITION OF HIGHER EDUCATION

by Dennis P. Jones

October, 1985

Prepared for the National Center for Education Statistics

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Note to Reviewers

This is the third of what will be at least four drafts of this document. At every step, reviewers' comments and suggestions have been solicited and, to the best of my ability, incorporated into the subsequent version. While the document is better than it was, there are still some weak spots, among them the sections dealing with student outcomes, faculty resources, and student financing. Although I seek your advice on all sections of the document, I would appreciate particular attention to those areas.

Please send any comments you have to me at

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or call me at (303) 497-0315.

Thanks in advance for sharing your wisdom.

Dennis P. Jones

INTRODUCTION

In January, 1985, the National Center for Education Statistics published a document entitled "Indicators of Education Status and Trends." As stated in the foreword to that document, the purpose was to "assist educators and education policymakers by informing their decisions and to assist the general public by describing the 'health' of American education." The medium chosen for describing the health of American education in this document was education indicators defined in the document as a "concise set of measures by which the public, educators, and policymakers might keep regularly informed on the progress and condition of education."

While the NCES publication is entitled "Indicators of Education Status and Trends," the contents deal almost solely with elementary and secondary education. NCES, however, recognizes the need for postsecondary education indicators in addition to those for elementary and secondary education; the same considerations that drove the development of indicators of elementary and secondary education apply to higher education as well. This paper constitutes a proposal to NCES concerning the indicators that should be built about higher education* and the form of their construction. It is a discussion draft written to engender thought and comment from those who would be the primary users of such a set of indicators were they to be developed, published, and regularly maintained. The intent is to revise this document based on comments received during the review process. Time taken to read and to provide suggestions for improvement will be rewarded by a better design for the information regularly provided about a major national

* The long-term need of NCES is for indicators of postsecondary education. Currently, however, the data to support development of indicators about this broader universe are not available. The framework has been developed with the long-term need in mind. The suggestions about development of specific indicators are confined to the universe of higher education institutions.

resource, the U.S. system of higher education. The balance of the paper is organized in four sections. In Section I, I briefly discuss the characteristics of indicators. In Section II, I propose a set of indicators about higher education in the United States that I believe to be most relevant to policymakers and the general public. In Section III, I suggest general approaches to calculating each of these indicators. In Section IV, I briefly address the adequacy of current data collection: In what areas is data collection adequate? In which areas do we have large unmet needs? It is hoped that the document will provide a useful foundation for the development of indicators about higher education and provide some guidance to NCES' long-term data collection plans.

I. CHARACTERISTICS OF INDICATORS

A great deal of theoretical work on indicators has been conducted in support of the development of "social indicators" (Bauer, 1966; Land, 1975; Sheldon and Freeman, 1970; Duncan, 1969). Sheldon (1975) states that ". . . the chief purpose of social indicators is to comprehend what the main features of society are, how they interrelate, and how these features and their relationships change over time."* While there are unresolved issues about both definitions and purposes of social indicators, Campbell and Converse note that two distinct emphases seem to emerge in most definitions of social indicators:

> First, the term is intended to convey a stress on descriptive measurement which is much more "dynamic" than most social science research has been to date . . . Second, and perhaps more notable, the call to arms represented by the social indicators lays a heavy stress on policy relevance.**

* Sheldon, Eleanor B., "The Social Indicators Movement." Proceedings of the 1975 ETS Invitational Conference, Educational Indicators: Monitoring the State of Education, ETS, Princeton, New Jersey, 1975, p. 7.

** Campbell and Converse, p. 3.

Dennis Gooler, proposing a definition of education indicators, suggests a somewhat more limited definition than that set forth by Campbell and Converse:

> . . . education indicators are statistics that enable interested publics to know the status of education at a particular moment in time with respect to some selected variables, to make comparisons in that status over time, and to project future status. Indicators are time series statistics that permit a study of trends and change in education.*

In developing indicators for elementary and secondary education, NCES determined that an education indicator

> "• consists of statistically valid information related to significant aspects of the educational system and can be a single valued statistic or a composite index;
>
> • provides a benchmark for measuring progress or regression over time, or differences across geographical areas or institutions at one point in time, such that substantive inferences can be drawn from presentation of the data;
>
> • is meant, where appropriate, to be representative of policy issues or aspects of education that might be altered by policy decisions;
>
> • can be easily understood by a broad array of citizens concerned with education;
>
> • is relatively reliable data and not subject to significant modification as the response errors or changes in the personnel generating it."**

While there is not unanimity about the definition of an education indicator, there is considerable agreement about the important characteristics. First, indicators describe significant aspects of the system of education with particular emphasis on those aspects that are policy relevant. Second, they monitor trends and changes over time. It should be noted that the NCES definition allows one-time data that show differences across geographic areas or institutions to fall within the definition of an indicator. In the balance of

*Gooler, p. 11.

** NCES, p. IV.

this paper, I have adhered to the more conventional definition that calls for indicators to reflect time series. Third, the data underlying the indicators must be acceptably reliable and valid. Finally, these data must be converted into information (indicators) in ways that are considered appropriate and acceptable by those who are the intended users of these indicators. It is presumed that the primary audiences are policymakers at the state and national levels and an informed general public. These basic criteria are utilized in the balance of this paper.

II. A SET OF INDICATORS IDENTIFIED

The characteristics of indicators listed above suggest numerous approaches to identifying a set of indicators that would describe the condition of higher education in America. First, it was noted that indicators should describe significant aspects of the system. As a consequence, one looks to descriptive models of higher education for guidance. Numerous authors (see, for example, chapter in Correa, 1975) have described higher education in terms of input-process-output models. Jones (1982) presents a more complex model incorporating students, institutions (and the faculty and other resources within them), critical constituents for higher education, and the major interrelationships among these entities as a way of describing the system. In its Indicators of Education document, NCES used a three-part description of the system--outcomes, resources, and context of education. In the absence of any community consensus about an alternative system model of the system of higher education and in an attempt to maintain consistency, the same major categories previously used by NCES will be employed here.

Second, it was noted that indicators should be policy relevant. This is closely related to a third criterion, that indicators be not only useful to, but accepted by, the primary users. As a result, a second step in identifying indicators of higher education is to (1) list the questions seemingly most often asked in the context of policy discussions and (2) identify the concepts and terms commonly used in policy discussions and debates concerning higher education (terms such as choice, quality, and productivity). This latter component is particularly useful since such terms are the policymakers' shorthand for the concepts and concerns that are central to their deliberations. Since these questions and terms represent the language of the primary group of intended users, they provide an obvious starting point in the quest for a set of higher education indicators that will serve the needs of these users.

By organizing these basic questions and concepts within the broad structure of the systems model suggested above, a useful framework emerges.

A. Outcomes

The outcomes of any system can be defined as the changes that occur as a consequence of that system. In higher education we seek changes or outcomes of at least the following four basic kinds:

1. Student outcomes
2. Discipline/knowledge outcomes (often labeled research outcomes)
3. Economic/societal outcomes
4. Civic/societal outcomes

Brief discussions of each of these areas along with my assessment of the questions central to policy and of the rhetorical concepts to which indicators might lend concrete expression are provided below.

1. Student Outcomes

The student outcomes of postsecondary education have been categorized (Ewell, 1984) into the following major groupings:

- Knowledge outcomes--general and specific
- Skill outcomes--general and specific
- Values and attitudes outcomes
- Behavioral or relational outcomes.

The first three of these (knowledge, skills, values) are roughly equivalent to the Student Performance category utilized by NCES in its earlier Indicators publication. The last is roughly the same as the transition category utilized in that publication. In higher education, the transitions of most importance are those to even more advanced study and those to the world of work.

The questions about student outcomes that arise in the policy context are of the following general kinds:

> Are recent college graduates as well educated as their predecessors? Are they competent in those areas of general knowledge and higher order skills that one would consider "basic" for a college educated person? Are some types of institutions doing a consistently better job of producing student learning and development than others? Are graduates prepared for the world of work?

Accompanying these questions is a good deal of discussion about achievement, competence, value added, persistence, and educational quality, all terms that help shape the long-term indicators agenda.

2. Discipline/Knowledge Outcomes

In this arena, the different disciplines themselves define the substructure of any classification scheme. The questions relevant to policy are particularly useful in identifying potential indicators. These questions are:

> Is the U.S. maintaining its position of leadership in research and innovation? In what areas is it lagging behind?

A key concept is research leadership.

3. Economic/Societal Outcomes

Seen through the eyes of many, higher education is an engine that drives the economy. Policy issues and questions that arise, given this perspective, are:

- What is the contribution of higher education to the economy? How dependent is the economy on higher education? Are there severe discontinuities between manpower demands of the economy and the supply of manpower being produced by higher education?

4. Civic/Societal Outcomes

Research (see, for example, Bowen, 1977) has shown numerous and varied outcomes of higher education that redound to the benefit of the broader society. Since these outcomes are so diffuse, however, they seldom

become the object of policy-level attention except in the most indirect fashion.

B. Resources

The resources put in place to generate this array of outcomes have historically been the focus of the preponderance of the prior descriptive effort. Much attention has been directed toward the amounts and quality of the resources available to higher education and to the efficiency with which those resources have been utilized. As a consequence there are some fairly conventional ways of categorizing resources for purposes such as this. The following is used in the balance of this document:

1. Institutions
2. Programs and curricula
3. Financial resources
4. Human resources
5. Physical resources

Perhaps because of the historic focus on resource topics, the policy questions and rhetorical concepts are sharper, more finely honed, and more generally understood. This condition is reflected in the kinds of questions listed for each of these categories.

1. Institutions

The system of higher education in the United States is a loosely coupled amalgam of autonomous or semi-autonomous units. This arrangement has

resulted in a diverse and pluralistic enterprise that has generally served the nation well. When one attempts to catalog the concerns that focus on the shape or nature of the system, a limited number of questions surface. One deals with the institutional composition of the system: Is institutional diversity increasing or decreasing? Is the industry becoming more concentrated in institutions of a particular type (locus of control)? The second deals with the level of autonomy granted (particularly public) institutions by the entities that govern them: "Are the institutions being controlled more tightly or are they being allowed more freedom?" These questions match directly the rhetorical concepts most often incorporated into any discussion of the system of higher education--diversity and autonomy.

2. Programs and Curricula

Some of the same diversity questions that surround a discussion of institutions also apply to programs or curricula within institutions. On the one hand, we pride ourselves on the variety of programs available to students in our colleges. On the other, we are concerned that students are concentrating in fewer and more specialized programs. Among the questions being asked are those dealing with the balance between liberal and professional education, between general and vocational education: "Is instruction in higher education becoming increasingly specialized? What is happening to the liberal arts?" The other deals with programmatic diversity: "Are the offerings becoming more diverse? Are enrollments becoming more or less concentrated in a handful of popular programs? Again the concepts of interest match closely with the issues and

questions--program diversity, professionalization/vocationalism, concentration of enrollments.

3. Financial Resources

In large measure, state and national policy with regard to higher education is carried out through the allocation of funds. As a consequence, there are many policy issues and questions that perpetually surround the topic of financial resources. Some deal with the financial aspects of institutions: Are expenditures on higher education changing significantly? Is the nation's level of investment in higher education being maintained? Who is paying the bill for higher education? Are the funders or shares changing? Is the allocation of resources to institutional functions changing? Are institutions using their resources efficiently? Are they being productive? How fast is the price of education (as reflected in tuition charges) increasing? How fast are the costs of goods and services purchased by institutions increasing? How do these trends compare with other price trends? Associated concepts are sources of funds, allocation of resources, price of education, costs of goods and services, efficiency, and productivity.

Likewise there are numerous questions and policy issues surrounding the funding of students: How are students and their parents financing college educations? Are they increasingly dependent on debt financing? Are financial aid funds sufficient to ensure student access? Here the issues are those of affordability and sources of funds.

4. Human Resources

Human resources, particularly the faculty, are at the heart of an institution of higher education. As a result, any assessment of the quality of education eventually must touch on the quality of the faculty. Since quality can't be measured directly, tangential issues and questions quickly come to the fore. Among them, "Is the faculty getting enough new blood?" Is it keeping current? Is the full-time faculty heavily involved in teaching undergraduates? Are they being productive? The emphasis is on faculty quality, faculty teaching efforts and involvement with students, and faculty productivity.

5. Physical Resources

Physical resources take several forms, most central being buildings and equipment. With regard to buildings, the issue is primarily one of deferred maintenance and rate of providing capital for improvements. For equipment the issue is one of technical obsolescence.

C. The Context for Higher Education

The higher education enterprise, in spite of its reputation as existing in an ivory tower, is in no way independent of the larger society. Indeed, it is linked to some external constituency at almost every turn. The student demand for the services of educational institutions is shaped by the demographic context--by the nature of the population from which students are drawn and by the extent to which individuals in that population are availing themselves of educational opportunities. The economic well-being of the enterprise is tied directly to the economic condition of states and the nation as a whole. The functioning of the system of higher education is also

affected by the political context surrounding it. Funding, amount of state control and oversight, and other factors are directly related to the favor (or disfavor) in which higher education is held at any point in time. Thus, in order to tell the story of higher education, it is important to take account of the context in which it resides. Because almost everything we define as social indicators could be considered as part of a contextual setting for higher education, there is an inclination to extend this section beyond that which would be truly useful. Recognizing this tendency, the contextual variables selected for inclusion have been limited to:

1. The Demographic Context
2. The Economic Context
3. The Political Context

This leaves out elements such as the technological context, for example.

1. The Demographic Context

A major policy concern has been, and continues to be, making the college experience accessible to those who can benefit from that experience and desire to do so. The questions that surround this topic deal with access, participation, choice, and equity. Is access to the system being maintained? Are choices (of institutions and programs) being constrained? Does the student body in American colleges increasingly mirror the characteristics of the population from which it is drawn?

2. The Economic Context

The broader economy directly impacts higher education in at least two ways. One is direct and straightforwardly economic; the healthier the

state and national economies, the better the economic prospects for higher education. The other is less direct. We observe the chain of weakened economy to increased unemployment of college age individuals to higher enrollments and the reverse of this chain leading to lower enrollments when things improve. To the extent that there are policy issues surrounding these phenomena, they deal with the extent to which higher education should share in (or be buffered from) the conditions in the larger economic environment.

3. Political Context

Colleges and universities exist in a web of constituent relationships. All of these create an impact on the workings of the enterprise through either direct or indirect means. The view of higher education held by the general public operates in an indirect way--subtly influencing the decisions and actions of those whose effects are more direct. Direct effects are made manifest through funding or regulatory mechanisms employed by agencies of the state and federal governments. The support for higher education reflected in public opinion and governmental action is a critical element in describing the broader context within which higher education resides.

The following figure summarizes the framework for indicators that has emerged out of the previous discussion.

OUTCOMES

Student Outcomes
- Student Performance
  - Knowledge
  - Skills
  - Values/Attitudes
- Transitions
  - To Further Education
  - Employment

Disciplinary/Research Outcomes
- Leadership in Research

Economic Outcomes
- Manpower Development

Civic/Societal Outcomes

RESOURCES

Institutions
- Diversity
- Autonomy

Programs and Curricula
- Diversity
- Professionalization/ Vocationalism
- Concentration
- Duplication

Financial Resources/Inst
- Sources
- Allocation
- Price of Education
- Costs of Goods and Services
- Productivity/Efficiency

Financial Resources/Students
- Sources
- Affordability

Human Resources
- Faculty Quality
- Involvement with Students
- Productivity

Physical Resources
- Deferred Maintenance
- Obsolescence of Equipment

CONTEXT

Demographic Context
- Participation
- Access
- Choice
- Academic Preparedness

Economic Context
- Economy
- Employment

Political Context
- Public Opinion
- Regulation

In the following section, approaches to constructing a set of indicators in each of these areas are discussed.

III. CONSTRUCTING THE INDICATORS

It is one thing to identify the information (in indicator form) that would be very useful to have on a recurring basis. It is quite another thing to actually construct the indicators. Constraints come in two forms. The first is the constraint of data limited by either availability or form (for example, when the basic data are available but are subcategorized in ways that limit their utility). The second is the more self-imposed limitation associated with choice

of the analytic approach to constructing the indicator. Given the available data and the general need to construct an indicator in a particular area, there remain many ways in which the data can be organized and presented in response to this need. In most cases there is no one right way. The requirement is to find an acceptable way, a formulation that, when tracked over time, will provide an indication of the direction and relative size of changes in the condition that is the focus of attention and that has meaning to the user.

In this section, possibilities for constructing indicators in each of the identified areas are discussed. In some of the areas, the data just do not exist. This condition will be noted. In other cases the data are available. In these cases the sources of data are noted and general procedures for constructing indicators suggested. With regard to the calculation approaches there are many options. I have generally opted for simple ratios and other uncomplicated forms of analysis. I have so chosen for two reasons. First, more complicated (and therefore more comprehensive in most cases) approaches have not been adequately developed in many areas. Second, the simple formulations are more transparent and therefore more easily understood by the user.

A major question to the reviewers is, "Are the measures suggested adequate representations of the concepts and phenomena of central interest? Are they reasonable (the best) given the limitations of available data?" Finally, "What additional data or alternative approach to their construction would improve them?"

While the indicators listed have been identified largely independently of each other, their greatest utility comes when they are seen in juxtaposition and come together to form a many-dimensional mosaic. Thus, the indicators developed will have more meaning--and will be responsive to many more users and their

questions--if the populations of students and institutions are systematically and consistently subdivided into meaningful subpopulations. For example, the indicators of student choice of institution and institutional sources of funding are collectively powerful only if the categorization of institutions used in both is the same. These subdivisions, however, are also constrained by data limitations. In most cases, it is possible to divide students according to characteristics of race and sex. It would be desirable if the student population could also be characterized along the dimensions of age, income, and ability levels. There are some data sets that allow such distinctions to be made, but in most cases these desirable subdivisions must be foregone because such distinctions are not reflected in the data that are periodically gathered. With regard to institutions, there are likewise a set of descriptive dimensions that are particularly useful in making distinctions appropriate for reflection in a set of indicators of postsecondary education. These dimensions are control (public, private) and type of institution (research university, comprehensive university, baccalaureate institution, community college, and a class of specialized institutions). These distinctions are carried through the development of indicators insofar as is possible.

In the balance of this section, I discuss the development of the individual indicators. The presentation is organized in accordance with the tri-partite organizing scheme presented at the end of the previous section.

A. Outcomes

1. Student Outcomes

a. Student Performance - Knowledge, Skills, and Values Outcomes

This particular component of student outcomes, for discussion purposes, is usefully subdivided further into the following five categories:

General Knowledge

Specific Knowledge (Knowledge Specific to a Discipline)

General Skills

Specific Skills (Specific to a Profession or Vocation)

Values and Attitudes

For purposes of developing a set of national-level indicators, it is suggested that the specific knowledge and skills categories be eliminated from further consideration. Admittedly there are measures in some of these areas--Graduate Record Exam (GRE) area tests for knowledge related to numerous specific fields and licensure and certification exams related to various occupations and professions. However, there are so many different fields in higher education and the possibility of getting appropriate measures on the spectrum so remote that attempts to fill in this piece of the puzzle are probably not warranted. There is one exception. Because the topic is education indicators and because it is important, overall, to show the two-way linkages between elementary/secondary education and higher education, it would be appropriate to include information about performance on tests that measure the specific knowledge and skills taught in teacher education programs. In the short run this probably is not feasible. An exam, the National Teachers Exam (NTE), is available, but is required in relatively few states. As a result, the representativeness of the base of students taking the exam is

highly suspect. A long-term objective would be to administer the NTE to a sample (every two or three years) of those individuals seeking first-time certification in elementary or secondary education. This would give a reliable and valid (to the extent that NTE itself is valid) measure of the knowledge levels of those entering the teaching profession.

It is in the area of general knowledge and higher order skills that periodic assessment of college graduates would be most appropriate as a device for commenting on the condition of higher education in the U.S. Some tests have been developed that could be used to measure such outcomes but they are not widely used. The ACT-COMP is the prime example of such a measurement instrument. The Undergraduate Assessment Program that ETS offered at one time but has since discontinued is another example. The GRE Verbal and Quantitative tests also measure some of the areas one would want to cover in a test of the general knowledge and skill competencies of college graduates. All of these tests have serious drawbacks regarding the sample of students that take them. The ACT-COMP is administered as a post-test at most Tennessee institutions and self-selected others around the country. Further, in its full form, it is relatively difficult and costly to administer. The GREs are taken by a set of students that elect to do so for their own purposes and therefore are far from representative.

The need in this area is for a new exam designed to measure general knowledge and skills development that could be administered to a sample of college graduates every two or three years. At the moment

the age 25 component of the National Assessment of Educational Progress (NAEP) may be the nearest approximation to such a test. At the very least, this age cohort should be tested more regularly than has heretofore been the case. A better solution would be a test explicitly designed to measure the general knowledge and skills expected of a college educated person and periodically administered to a sample of graduating seniors.

In the absence of this desirable solution, are there alternatives? I reluctantly conclude that there are not. Adelman (1985) has studied the standardized test scores (LSAT, GMAT, GRE/Quantitative and Verbal) of college graduates for the period 1964-1982 and argues persuasively that "the measures are proven ones and the results are important indicators of student learning" (p. 29). He also notes, however, that he does not "mean to imply that trends in scores on standardized tests should be the principal indicator of quality in American higher education" (p. 25). With the paucity of other available indicators, there is a significant danger that these test scores would emerge as the principal measure of quality. Adelman concludes with a call for additional research, a conclusion that I would echo.

The Cooperative Institutional Research Program (CIRP) is a long-standing source of data on student attitudes and values. These data are available annually for incoming freshmen. As a consequence, these data more appropriately describe high school outcomes than collegiate outcomes. In the context of higher education indicators, the data collected from freshmen have a greater utility in describing

student characteristics than student outcomes. Sporadically, senior follow-ups have been conducted. In 1982 a regular series of two-year and four-year follow-ups were initiated for a subset of students providing data as freshmen. This opens the possibility of obtaining change measures on a variety of attitude and values dimensions (like the importance of making money, the value of learning for its own sake, and career preferences) as well as data on such things as changes in majors. The first four-year follow-up is now being sampled. If continued in future years, important measures of values and attitudes outcomes will be readily available. Population level statistics are estimated from the data available in CIRP so that the limitations of other data in this regard are not at issue. CIRP data, however, are limited in another, serious way. CIRP data are collected only from full-time students. As a result, a large proportion of the total higher education student body is not reflected in CIRP data. (The appendices in Astin, et al., 1984, provide a useful guide to the data in CIRP.)

Because the CIRP is by far the most widely used of the instruments available for assessing attitudes and values, an important step is to ensure that the two-year and four-year follow-ups are conducted on a regular basis. This step, of course, in no way rectifies the problem of the omission of part-time students. Put in perspective, I believe it much less important to overcome this problem than to develop acceptable measures of general knowledge and skills outcomes.

b. Behavioral/Relational Outcomes

From many perspectives, higher education is a means to other ends--getting a job, improving personal economic conditions, etc. As a result, one can consider as student outcomes data those data that measure students' transitions to, and relationships with, other social institutions. Traditionally, primary attention has been directed toward transitions to either further education or the world of work. There are numerous other candidates including roles in professions, civic and social organizations, and the family unit. While these other roles are important, I would argue that, for state and national policy purposes, those behavioral outcomes that reflect relationships to academe (degree completion, persistence, and transition to further education) and to the workplace and the economy generally are the measures of greatest interest, if not import.

1) Relationships to Academic Institutions

In considering those behavioral outcomes that derive from the status of students vis-a-vis higher education, it is useful to think of the progression represented by (a) persistence/retention as opposed to attrition, (b) receiving the degree and becoming academically credentialed, and (c) moving on to the next level of higher education. Because the emphasis is on progression and transition, the preferred mechanism for collecting data is through longitudinal studies. The National Longitudinal Study (NLS) and the High School and Beyond (HSB) study are good examples of this approach. Unfortunately, these students collect data on only two cohorts and those eight years apart. What is needed is a cohort every three years or so. Except for

periodicity, these surveys provide data that allow calculation of retention, time-to-completion of the degree, and proportion of graduates proceeding to the next level of education. These are all indicators that I would highly recommend.

In the absence (at least in the short run) of data to periodically map these trends, alternative and less satisfactory constructs are required.

a) Attrition/retention. There are no retention data available on a national basis that are collected frequently enough to meet the time-series requirements for indicators. It is possible, however, to develop a crude approximation by using the following formulation based on HEGIS data:

$$\frac{\text{Number of baccalaureate degrees granted in year T}}{\text{Number of entering freshmen in year T-4}}$$

It can be argued that the denominator should be T-5 given the increasing time to completion for many college students. It could also be [(T-4) + (T-5)] / 2. This question can be addressed analytically when actual indicators are developed. Data for the community college sector should be excluded from this particular calculation.

A similar calculation can be made for the community college sector also using HEGIS data:

$$\frac{\text{Number of associate degrees granted in year T}}{\text{Number of entering freshmen in year T-2}}$$

Because of the large numbers of part-time students in community colleges and the proportion attending with no intention of completing a degree program, the absolute values resulting from this calculation will have little use. The trend data, however, may prove useful.

b) Program completions. As a straightforward indicator of student outcomes, it is appropriate to report the numbers of degrees granted each year by type of degree--doctoral, first-professional, masters, baccalaureate, associates, postsecondary diplomas and certificates. These data are readily available from HEGIS.

c) Transition rates to upper division or graduate schools. It is useful to assess the proportion of community college students graduating from AA or AS programs that transfer to four-year institutions to further their education. Similarly, it is useful to assess the proportion of baccalaureate program completers that progress to graduate school. The most direct measures of these transitions are calculated from the data available in the National Longitudinal Survey (NLS) and the High School and Beyond survey. They have the particular benefit of capturing transition rates of community college graduates. Unfortunately these data are relevant for only two cohorts and, therefore, have limited utility in building indicators that would document trends on a more regular basis. As an alternative, the transition rates for baccalaureate and

master's program completers can be calculated from data collected through the Recent College Graduates survey. Because of the timing of this survey, these data do not reflect transitions for those students who do not proceed directly from undergraduate to graduate programs (or from Master's to doctoral level work). Nevertheless, as trend data, an indicator derived from these data that reflects the proportion of graduates (by field) that proceed to the next level of study would be very appropriate.

2) Employment

Success of college graduates in the workplace is another indicator of student outcomes. Are they getting jobs? Are they in fields for which the individuals were trained? An indicator that addresses the first question is calculated as follows:

$$\frac{\text{Proportion of college graduates employed}}{\text{Proportion of non-college graduates}}$$

In creating this indicator, employment data for a specified age cohort (say 21-34) factors in both the numerator and denominator. These data can be obtained from the Bureau of Labor Statistics.

This calculation focuses on an age cohort as the unit of analysis. The capacity also exists to look at employment of individuals who received bachelors and masters degrees in a given year. This cohort is surveyed through the Recent College Graduate (RCG) survey conducted by NCES. Using the data gathered through this survey, it is possible to calculate proportion of

graduating class employed in the field for which they were educated. The converse form of reporting these data would be the proportion of program completers that is underemployed (this is the form utilized in Social Indicators III).

The follow-up data contained in VEDS provided another source of employment data--proportion of completers employed in fields for which they were trained. These data proved difficult to get and unreliable and their collection has been discontinued. As a consequence, there is no similar employment related data available concerning graduates of two-year programs.

3) Individual Economic Benefits

Another measure of the outcomes of postsecondary education is the economic benefits--both absolute and relative--accruing to those who have completed college. One measure would be starting salaries for recent college graduates. Basic data for this indicator are collected by NCES through its survey of Recent College Graduates. This survey is being done annually and collects data in such a way that starting salaries for students with degrees in different fields can be reported.

Academic interest has focused over the years on studies designed to yield estimates of either net present value or an internal rate of return on an individual's investment in higher education. Psacharopoulos and Hinchliffe (1973) note that internal rates of return are most often reported and Eckaus (1973) presents a methodology for calculating this indicator. It is an

understatement to say that many methodological issues and complications surround the calculation of rates of return including issues of specifying the appropriate costs, deciding whether earnings or income should be used as the dependent variable, and determining the nature of any adjustments to the calculations required for student ability, family socioeconomic status, academic program, etc. Given all the complications, I suggest reverting to the use of data more readily available. The Census Bureau (O'Neill and Sepielli, 1985) has recently published data on the median income for individuals in different age groups for the years 1940-1983. Distinctions are made between those having college degrees and those having a high school diploma. The data are limited in that they reflect earnings of males only. Nevertheless, they are readily available and the ratio of earnings of college graduates to the earnings of those holding high school diplomas represents a crude, but perhaps still useful, measure of the economic benefit of a college degree. In any future application of this indicator, earnings for females should also be included, at least for the years in which substantial proportions of women are in the work force.

4) Other Outcomes

Bowen (1977), Ewell (1984), and others have cataloged a much longer list of relationship variables that represent outcomes of postsecondary education. Included are variables describing civic participation (voting rates), strength of family ties (divorce rates), incidence of criminal behavior, and other such factors.

Data for many of these variables showing differences for individuals having different educational backgrounds can be compiled. For the purposes at hand, however, it is suggested that these outcomes are better viewed from the societal rather than the student perspective. As a result, they are touched upon in the context of the civic/societal outcomes section below.

2. Discipline/Research Outcomes

The development of new knowledge is a critically important function at 100-150 institutions of higher education. Further, the conduct of academic research and the generation of research outcomes is very much a national priority. Thus, when dealing with the outcomes of higher education it is important to recognize the development of new knowledge as a significant category of outcomes. This topic is not treated extensively in this paper only because the National Science Board in its publication, Science Indicators, devotes more (and more thorough) attention to the topic than is possible here. For academic science, the National Science Board reports on number of patents granted and number of institutions acquiring patents. They also report publication rates for faculty in different disciplines. Further, they have developed citation indices, by field, that indicate the impact or utility of publications relative to the number of articles published. Given the thoroughness with which such measures have been developed, it is suggested that any research outcomes incorporated be drawn directly from the National Science Board publication. If any were to be used, I would suggest the following:

- U.S. Proportion of the World's Science and Technology Articles, by Field
- Relative Citation Ratios for U.S. Articles, by Field
- U.S. International Transaction in Royalties and Fees (a possibility since it reflects extent of technology transfer)

It should be noted that these data refer to discipline/research outcomes for science and engineering fields only. This is a significant limitation. However, since the policy issues most frequently revolve around U.S. advances and leadership in technology-related fields, these data are directly relevant to the topic of central concern.

3. Economic/Societal Outcomes

In the student outcomes section, potential indicators of economic benefits of higher education to students were identified. But there is also a national or economy-wide perspective on the contributions of higher education. Much of the rationale for making a public investment in higher education is based on economic arguments: "Higher education contributes to economic development" or "It is necessary to ensure that the U.S. remains economically competitive vis-a-vis other nations," or "Without the well-trained manpower produced by colleges and universities we cannot compete economically."

Denison (1962 and 1964) conducted studies that allowed him to estimate the percent of growth in total real national income that could be traced to education as well as that portion that could be ascribed to the advancement of knowledge. His studies covered the period 1929 to 1962.

Psacharopoulos (1973, chapter 7) also developed an approach to these calculations. While the studies have been conducted and a methodology (or methodologies) developed, I am unaware of any recent such studies that make these estimates current enough for use. Because the estimates are for all of education, with attempts to partial out higher education from elementary/secondary education, it may be useful to periodically (every five years or so) update these studies in support of indicators work at both levels.

With regard to manpower development, the survey of Recent College Graduates provides a basic source of data. Through that survey NCES develops information on underemployment of graduates with degrees in various fields. To the extent there is no underemployment, one can presume a shortage in the field. Given these data, time-series can be developed for the major fields indicating percent underemployment of recent graduates over time. These data are confined to baccalaureate and masters degree holders so the question of under or over supply of individuals with both more advanced degrees and vocational/technical training is not addressed.

4. Civic/Societal Outcomes

As noted above, higher education contributes to students' relationships with society in many ways. While it is possible to view such outcomes from the student perspective for the purpose of this document, it is more useful to take the societal perspective. Most of the indicators that might be of interest here are subsets of the broader set of social indicators, such as those published in Social Indicators III (Bureau of the Census, 1980). Unfortunately, very few of the data that would be of

most use here are published in such a way that they indicate disaggregations by level of educational attainment. However, the raw data from which these indicators are developed do include such distinctions. As a result, indicators for such general areas as Marital Status and Stability, Health Status, Crime Rates, and others can be developed with distinctions made between those who are college graduates and those who are not. It would be appropriate for NCES to request such distinctions be made whenever analyses are being carried out for future Social Indicators reports. These indicators provide useful additional context regarding the benefits of higher education. They are sufficiently far removed from the core requirements of higher education indicators, however, that a heavy investment of NCES resources to obtain them is probably unwarranted.

B. Resources

For purposes of this document, the major category labeled "Resources" has been divided into five subcategories. As indicated in the previous section, these subcategories are:

1. Institutions
2. Programs and Curricula
3. Financial Resources
4. Human Resources
5. Physical Resources

Each of these five kinds of resource indicators are discussed in more detail in the remainder of this section. In dealing with resource issues, two quite different aspects of the issue typically arise. First, there is a set of

questions about the size, nature, and quality of the resource. Second, there is a set of questions about the utilization of the resource. This distinction is carried through the discussion of resource indicators.

1. Institutions

As noted in Section II, the two topics that typically arise concerning the system of higher education in this country are those dealing with the diversity of the institutions within the system (is the system becoming more heterogeneous? more homogenous?) and with the autonomy of the institutions within the system. Diversity is determined by both the number of institutions of various kinds and the distribution of student demand across these sectors. The background data for these indicators would be:

- the count of institutions in each institutional sector--where sector is defined by control and type of institution
- FTE student data (a measure of demand) for each institutional sector.

These data are available from the Higher Education General Information Survey (HEGIS).

One can create indicators from these data by calculating simple proportions:

- proportion of the total number of institutions in each sector
- proportion of total number of FTE students enrolled in each institutional sector.

These proportions can be reduced to a single number by calculating a dispersion statistic for categorical data. A form of this statistic is presented in Appendix A. The result of this calculation is a single number that indicates diversity along a continuum from complete diversity (the proportions in all categories are the same) to complete concentration (all the institutions or FTE students are found in a single category). By calculating this indicator over time, it is possible to sense movements toward greater or lesser levels of diversity.

The development of an indicator of institutional autonomy is much more problematic. Volkwein (1984) presents a methodology for assessing the level of state control over public institutions. His was a one-time study and the methodology was applied only to major research universities. Nevertheless, a methodology has been developed and could be utilized every 2-4 years in an attempt to determine trends. Given the methodology, it would be most appropriate to use states as the unit of analysis and determine:

- the proportion of states in which institutional autonomy has increased, decreased, or remained the same over the time period.

A poor, short-term alternative can be constructed if one assumes a direct correlation between funding and control--the greater the proportion of funds an institution receives from governmental sources (local, state, federal) the greater the amount of regulation and control likely to be exerted over the institution. Based on this assumption, one can calculate an indicator as:

- the proportion of institutions in which the proportion of funds received from government at all levels has increased, decreased, or stayed the same over the time period.

In calculating such an indicator, an arbitrary figure (such as a $\pm$ 2% change) would have to be utilized in determining those institutions for which increases or decreases should be registered.

2. Programs and Curricula

The areas for which development of indicators concerning programs were deemed important were those depicting a changing degree of professionalization or vocationalism in the curricula, changing levels of programmatic concentration or diversity, and measures of program duplication.

In calculating a measure of professionalization or vocationalism, it is suggested that a simple ratio be calculated:

$$\frac{\text{Number of arts and sciences baccalaureate degrees awarded}}{\text{Total number of baccalaureate degrees awarded}}$$

In this calculation the number of arts and sciences degrees would be determined by summation of the baccalaureate degrees determined to be "arts and sciences" through an enumeration of categories in the Classification of Instructional Programs (CIP). Those fields typically considered pure academic fields (natural and life sciences, humanities, social sciences) would be considered arts and sciences and the applied fields (business, education, agriculture, etc.) would not. This ratio can be calculated for the system as a whole and for each institutional sector.

As a second component, the same calculation can be made at the associate degree level with the following formulation

$$\frac{\text{Number of general studies associate's degrees awarded}}{\text{Total number of associate's degrees awarded}}$$

In many ways, it would be more appropriate to use student credit hours rather than degree-granted data in this calculation. This would reveal the extent of arts and sciences instruction rather than just the number of degrees granted. However, such student credit hour data are not available and are not contemplated in IPEDS or other data collection activities. In their absence, degrees-granted data are a reasonable alternative.

With regard to program diversity, I suggest that two indicators be developed. First, the proportions of baccalaureate, masters, and doctoral degrees in the following groupings should be tracked over time:

- Humanities
- Physical and Life Sciences
- Social Sciences
- Professional Physical and Life Sciences (Engineering, Medicine, Agriculture, etc.)
- Other Professional (Business, Education, Law, Journalism, etc.)

This would provide more information than the indicator described above that dealt with relative proportions of arts and sciences degrees. Second, I suggest that the dispersion statistic employed in calculating institutional diversity be applied to degree granted data to yield a measure of programmatic diversity. The dispersion statistic could be

calculated separately for each degree level. This statistic would reflect the changing extent of diversity (or concentration in degree awards) at each level. At least at the baccalaureate level it would also be useful to calculate this ratio by institutional sector.

3. Financial Resources

A major focus of most policy debates concerning higher education is the question of financing--how the costs of operating the system of higher education should be shared by the various constituents of the enterprise. No indicator can answer that question. At best, indicators can provide a useful ready reference regarding past trends in the proportions of the load assumed by the different constituents of the enterprise: students and their parents, state and local governments, the federal government, individual and corporate benefactors, and the institutions themselves. Unfortunately, the decentralized and diverse methods of funding higher education in the United States makes the calculation of these simple proportions extremely difficult. Research has shown that it, in fact, can be done (Brinkman, 1983), but the effort required is probably not consistent with the resources available on an annual basis. Those calculations that can be made easily leave one with a very incomplete picture. A significant problem arises because there is one set of data concerning the funding of institutions, another dealing with funding of students, and the two are highly interrelated. For example, the federal government provides most of its contributions to higher education through student assistance. These funds, however, are shown as tuition revenues rather than grants from the federal government in the data provided by colleges and universities through HEGIS. There are two choices: 1) to

report two sets of "shares" data, one indicating the proportion of institutional support of various kinds, the other the sources of support for students, or 2) a single composite indicator that tracks funds regardless of their paths to the institution back to their original sources. Because policies at the state and national levels focus primarily on institutional and student funding respectively, it is recommended that the former course of action be adopted, that is, that there be developed one set of trend data regarding the immediate sources of funds for institutions and a second set reflecting the relative levels of student support derived from various sources.

The institutional funding component can be readily derived from the current fund revenues section of HEGIS. It is useful to show proportions of funds from various sources for all institutions and for public and private institutions separately. The categories of interest are:

- tuition
- state and local appropriations
- federal grants and contracts
- private gifts and grants
- institutional sources/endowments
- sales and services
- other

At the state level (and for public institutions), a policy discussion that has held sway for several years and is expected to continue unabated into the foreseeable future focuses on the relative shares of educational costs carried by students and the state. In response, I suggest creation of a simple indicator that provides systematic information about the

numbers of states in which the relative shares were changing and the directions of change. For example, one could calculate the number of states in which the state share is up more than 2%, down more than 2%, or unchanged (up or down less than 2%). The 2% figure is arbitrary and would have to be revised on the basis of the results of actual analysis. The calculation would be:

$$\frac{\text{State appropriations to higher education (including state student aid)}}{\text{State appropriations (including state student aid) + tuition revenues}}$$

The state appropriations and student aid data are available in Higher Education Financing in the Fifty States (McCoy and Halstead, 1984). Tuition revenue data are available from HEGIS.

Going hand in hand with questions of sources of funds are questions concerning changes in patterns of resource allocation. The major response to this need is a display of the proportion of institutional current funds being allocated to the following purposes:

- Instruction
- Research
- Public Service
- Academic Support
- Student Services
- Institutional Support
- Operation and Maintenance of Plant
- Scholarships and Fellowships
- Other

Such data should be presented for the different types of institutions as well as for the set of institutions as a whole.

These data are particularly difficult to display in anything but tabular form. One solution is to display data regarding the various functions separately. That is, to display the proportions of expenditures for instruction by sector as one indicator and to display the proportion for student services as a separate indicator. A second solution is to derive some additional indicators using these proportions as base data. For example, one can calculate the proportion of expenditures being made on programs that are directly student service oriented:

$$\frac{\text{Expenditures for instruction + academic support + student services}}{\text{Total current fund expenditures}}$$

Borrowing from both revenue and expenditure data, one can also calculate

$$\frac{\text{Expenditures for scholarships and fellowships (excluding federal funds)}}{\text{Tuition revenue}}$$

Both should be calculated by institutional sector. Measures such as these, in the end, probably are more useful than a display of current funds allocated to the various institutional programs.

Closely allied with indicators such as these are indicators dealing with institutional productivity or efficiency. In developing a measure of efficiency, it would be most desirable to develop measures of "technical" efficiency, measures that relate physical units of input to the outputs (FTE faculty/FTE students or square feet of instructional space/FTE student). However, with currently available data these calculations are not possible. With the advent of IPEDS, the possibilities are expanded.

Provision is made therein for collection of student credit hour data (thus allowing a better measure of level of activity) and of part-time faculty (thus allowing a calculation of FTE faculty). In the absence of such data, however, it is suggested that efficiency (or productivity, in June O'Neill's parlance) be calculated simply as instructional cost per FTE student:

$$\frac{\text{E\&G expenditures - research expenditures - public service expenditures}}{\text{FTE students}}$$

These data are available from HEGIS.

Various schemes have been developed for weighting graduate and undergraduate students differently with the predominant approach being to weight graduate students three times as heavily as undergraduate students. While this calculation makes sense at an institutional level, there is no evidence that it can be done in such a way as to enhance the meaning of information on an aggregate basis. Further, a "meta-analysis" of past cost studies currently underway suggests the 3:1 ratio to be inappropriate for at least some types of institutions. Therefore, it is recommended that no weighting scheme be used until such time as research being conducted at NCHEMS and elsewhere yields results that provide a sound basis for an alternative course of action.

Because the inputs are expressed in dollar terms, the expenditure data used in this calculation should be deflated to remove the effects of changing resource prices. The Higher Education Price Index (HEPI) is an appropriate deflator. Changing mixes of resources cannot be reflected

since the production function is not specified in terms of physical units.

Parallel to a concern with institutional financing is a concern with student financing. As noted previously, the issues of student financing revolve around the price of education and the sources of funds available to students with which to meet that price. Indicators in each of these areas are proposed.

The technically correct way to calculate price changes is relative to a fixed "market basket" of goods--the method of calculation of the Consumer Price Index (CPI). In this case the market basket is a fixed number of enrollments at all (or a representative sample of) institutions. In such a calculation the factors associated with changing preferences in institutions are separated from price changes at those institutions. Such a methodology was developed and price changes calculated over several years. The results were reported in Brown, Kahl, and Kriz, 1982. The results were presented for all of higher education and for the different institutional sectors. It is suggested that this methodology be utilized and extended.

In order to put this "Tuition Price Index" in context, it would be appropriate to juxtapose it with the CPI, the measure of changing price levels of all consumer goods and services. It would also be appropriate to put these price changes in the context of changes in personal disposable income, the income available to families which they can use to pay tuition bills. This "affordability" index can be constructed as:

$$\frac{\text{Tuition price index (year T) - tuition price index (year T-1)}}{\text{Personal disposable income (year T) - personal disposable income (year T-1)}}$$

The remaining issue regarding student financing is that dealing with sources of funds used to pay educational expenses. This is an area in which there is a data trap around every turn. There is a need for data that provide a reliable indicator of sources of funds for students having different characteristics (preferably including race/ethnic, sex, ability level, and socioeconomic status at the very least). At the moment reliable data do not exist. Financial aid data are collected as part of the High School and Beyond (HSB) survey, but these data have all the problems associated with self-reported data. Further, these data will have little utility as support to indicators development until they are collected on a new cohort every two or three years. Abundant data are available through the federal offices responsible for administering student financial aid funds. These data, however, are organized by program rather than by student and they do not cover the full range of sources of funds available to students. Even the detailed administrative records held in campus financial aid offices often are not complete with regard to sources of funds not controlled by the college. If reliable and valid student financing data are to be obtained, it will have to be through a new data collection effort. In the short run, one must look for alternatives. In all probability, the best source of data relative to student financing is CIRP, even though it has the significant problems of being for full-time freshmen only and being based on self-reported information. Nevertheless, by using these data, it is possible to construct trends of student financing categorized by:

- Funds from parents or spouse
- Work or personal savings
- Grants and scholarships
- Loans
- Other sources

In developing subcategories within this measure, the obvious choice is to base more detailed data on levels of family income, also available in CIRP. There are various possibilities available but a categorization of less than $10,000, $10,000 to $25,000, and $25,000 and above would suffice.

Use of CIRP data is suggested primarily because they are collected annually and because a rich set of student characteristics data is part of the CIRP record. Annual availability allows a focus on trends rather than absolute values, a necessity if self-reported data are to be the basis of this indicator.

Again we are faced with the necessity of either presenting data in tabular form or of finding indicators derived from the source distribution data. The two indicators of this latter sort that I would suggest are:

$$\frac{\text{Funds from parents, spouse, work, and savings}}{\text{Total funds}}$$

and

$$\frac{\text{Funds from loans}}{\text{Total funds}}$$

In all cases, these indicators should be developed for subgroups of students, particularly those having different socioeconomic backgrounds.

4. Human Resources

As noted in Section II of this paper, the questions of central interest with regard to human resources are those dealing with the quality and utilization of human resources. Because the faculty is at the core of the instructional process, information about the quality of the faculty and the extent of their involvement in the teaching and learning process should be of high priority. Since quality cannot be assessed directly, it is necessary to search for surrogate indicators. Several are possible. One indicator of faculty quality is the extent to which the faculty cadre is renewed each year.

$$\frac{\text{Number of new full-time faculty}}{\text{Total number of full-time faculty}}$$

A measure of institutional flexibility in this regard is the tenure status of the faculty:

$$\frac{\text{Number of full-time faculty with tenure}}{\text{Total number of full-time faculty}}$$

An additional descriptor is the proportion of faculty having terminal degrees in their fields:

$$\frac{\text{Number of full-time faculty with terminal degrees}}{\text{Total number of full-time faculty}}$$

As a measure of faculty involvement (and some would say of faculty quality), one can calculate the full-time/part-time mix of the faculty:

$$\frac{\text{Number of full-time faculty}}{\text{Number of full-time plus part-time faculty}}$$

or

$$\frac{\text{Number of full-time faculty}}{\text{Number of FTE faculty}}$$

Finally, it would be instructive to calculate the proportion of student credit hours taught by full-time faculty:

$$\frac{\text{SCH taught by full-time faculty}}{\text{Total SCH taught}}$$

Of all these potential indicators, only the one dealing with tenure status can be constructed with HEGIS data. With the advent of IPEDS, data on part-time faculty will become available allowing calculation of the full-time/part-time mix of the faculty. There remain many useful indicators that cannot be constructed with available data. This is another area in which attention to additional data collection must be directed. There are two alternatives to collection of such data. One is to expand the faculty section of IPEDS. An alternative strategy is to sample a group of faculty as was done in faculty surveys conducted as part of CIRP in 1972 and 1980. Such surveys would allow collection of data on faculty time allocations (to instruction, research and administration) as well as basic descriptive data. An indicator of the proportion of faculty time directed to instruction, by institutional sector, could readily be calculated from this set of data. For maximum benefit, it is suggested that both approaches be used in tandem--the IPEDS set expanded to collect data about terminal degrees, addition to the faculty, and SCH taught by full-time faculty and a survey of faculty conducted to acquire more data about faculty involvement in teaching. This survey could also be designed to collect a series of data on faculty values, attitudes, preferences and priorities--a potentially important set of trend data.

With regard to productivity of faculty a simple, but useful, indicator would be:

$$\frac{\text{FTE students}}{\text{FTE faculty}}$$

This calculation must also await IPEDS and the collection of part-time faculty data. IPEDS will also make it possible to calculate non-faculty staff to faculty ratios. These ratios are of considerable interest. Both administrator to faculty and support staff to faculty ratios would be worth calculating, preferably on an FTE basis.

5. Physical Resources

As indicated in Section II, the issues of current concern in this arena revolve primarily around the questions of deferred maintenance of buildings and obsolescence of equipment. The "rate of replacement" of buildings, an indicator that can be compared to the depreciable life of buildings, can be calculated as

$$\frac{\text{Total replacement value of physical plant}}{\text{Net capital investment in current year}} = \text{years to replace}$$

This ratio can be calculated from data available on the HEGIS finance form (Part C - Physical Plant Assets). The ratio should be developed for the system as a whole and for the various sectors.

The same type of formulation used with buildings can be employed relative to equipment resources, with one exception. The data available from the HEGIS finance form regarding equipment allows for calculations on the basis of book value rather than replacement value. Because the life span of equipment is significantly shorter, the difference between book and

replacement is less, reducing the issue to one of lesser moment. This means that the formulation of the indicator would be:

$$\frac{\text{Book value of equipment}}{\text{Net addition to value of equipment during current year}} = \text{Yrs. to replace}$$

Again the ratio should be calculated for the system as a whole and for the various sectors.

C. Contexts

While there are many dimensions to the context within which the system of higher education functions, three of these dimensions--the demographic, economic, and political--are especially important. In this section, indicators in each of these areas are proposed.

1. The Demographic Context

Much of the "condition of higher education" is directly attributable to the numbers and characteristics of those individuals that choose to engage in postsecondary education in one way or another. This in turn is strongly related to the underlying demographic characteristic of the society. Of particular importance here are measures of participation and choice--participation referring to the numbers and characteristics of those who are involved in any way and choice indicating the nature of the involvement.

In developing indicators of participation, one seeks to compare the numbers and characteristics of those individuals enrolled in a college or university with the numbers and characteristics of an underlying comparison group. The college student population can readily be compared

to two larger comparison groups--the total age-relevant cohort in the population and the cohort of high school graduates from the previous year.

Two sources of data are available from which to construct the measures of participation relative to the overall population (really the age-relevant subcomponent). From the HEGIS, one gets total student enrollment data with disaggregations reflecting race/ethnic and sex distinctions. Unfortunately, there are no age data reported in HEGIS, a deficiency being rectified with IPEDS. Until IPEDS data are available, reasonable comparison of enrollment data with data about the underlying population as collected by the Bureau of the Census will be impossible. One can use arbitrary age ranges (for example, 18-34), but this is a less than desirable approach.

An alternative approach utilizes October Current Population Survey (CPS) data from the Bureau of Labor Statistics. This data is such that it allows calculation of participation rates for subsets of students characterized by income quartile as well as race and sex. The methodology is developed in Tierney (1982). The same fundamental approach is utilized by NCES in developing projections of higher education enrollments. Because the CPS is a sample of a reasonably small number of households, the number of cases is too small to yield estimates of participation by race except for a white/nonwhite distinction. This is a relatively minor limitation on an otherwise fruitful approach.

A more easily calculated version of participation rate can be expressed as follows:

$$\frac{\text{Full-time headcount UG enrollment [from HEGIS]}}{\text{No. of individuals age 18-21 in the population [from Census]}}$$

$$\frac{\text{Part-time headcount UG enrollment [from HEGIS]}}{\text{No. of individuals age 18-34 in the population [from Census]}}$$

This formulation embodies the assumptions that full-time students are preponderantly drawn from the 18-21 year old cohort and that part-time students older than 34 are small in number. These are admittedly simplifying assumptions, but such a formulation has been found useful for enrollment analyses at the state level.

An indicator comparing the number of first-time freshmen with numbers of high school graduates in the previous year can also be a useful representation of participation rates. These numbers can be generated directly from NCES data--the first-time freshmen enrollments from HEGIS and the number of high school diplomas granted from elementary/secondary surveys. If longitudinal surveys such as HSB were conducted with greater regularity, this calculation could be made in a much more meaningful way in that various demographic characteristics could be added to this indicator.

In addition to the other characteristics of those individuals who are participating in higher education, it is important to have a sense of their academic preparation, the "quality" of the pool from which participants are drawn. While the national level data relevant to an assessment of quality of incoming students is limited, there are some items that fit neatly within this category.

First are those kinds of data that NCES has used as measures of student outcomes at the secondary level, ACT and SAT scores. The limitations of

this data--among them self-selection and changing characteristics of the test-taking population--are much discussed and well known. Nevertheless, these data represent an obvious linkage between elementary/secondary data and postsecondary data and have some utility for that reason alone.

Second, and probably more useful, is an indicator based on the high school rank in class of the incoming freshman class. Such data (for full-time students) are available in CIRP.

In this data set, academic rank data are reported on the basis of quintiles. As a result, it is possible to create an indicator that reports, for example, the percentage of the incoming freshman class that graduated in the top 20% or 40% of their high school class. This indicator can be developed for all institutions, public and private. Unfortunately, CIRP utilizes the two-year, four-year, university institutional classification. This is useful, but these data would be better if the NCES classification were utilized. Further, this type of data would be a natural inclusion in a more regularly conducted HSB-type longitudinal survey.

While the above measures describe the fact of participation, they do not deal with the extent or intensity of participation. At the macro level manner, an indicator of extent of participation can be constructed as

$$\frac{\text{Total student credit hours}}{\text{Number of headcount students}}$$

However, until the advent of IPEDS, the student credit hour data will not be available. As a short-term alternative, a relative "full-timeness" indicator can be derived as

$$\frac{\text{Number of FTE students}}{\text{Number of headcount students}}$$

This indicator should be displayed by institutional sector.

We are seldom content to confine our interest to student participation. We also want some indication of student choice. There are many different versions of choice--choice of institution and choice of major being two possibilities. It is suggested that choice of institution is the primary area of policy interest. At least choice of institution is more susceptible to policy manipulation than is choice of program. Besides, choice of program is reflected in the degrees awarded data that are provided as the building block for the program diversity data. One of the difficulties of an indicator of institutional choice is that it lends itself best to a matrix display with type of institution on one dimension and student characteristics on the other. The student characteristics of primary interest are race, sex, ability and socioeconomic status. Of these only race and sex are readily available. This makes a display of longitudinal data particularly cumbersome. It could well be that the most useful display is one that shows only those situations in which choices were either disproportionately high or low relative to the underlying populations (e.g., that Asian Americans attend research universities and Hispanics attend community colleges in numbers exceeding those that might be expected).

As an extension of the choice notion, it would also be useful to track the college choice patterns of those students who graduate in the top 20% or 40% of their high school class to see if there are changing patterns among those generally deemed academically most able. Such data can be

obtained from CIRP, although the institutional classification used therein is slightly different from that used by NCES.

2. Economic Context

With financial resource issues central to policy debates regarding higher education, it is important to place the higher education "industry" in a broader economic context. One important consideration is the size of the higher education enterprise in relationship to the entire economy. Is it a growth industry or a declining industry? An indicator addressing this topic can be constructed as

$$\frac{\text{Total expenditures by higher education}}{\text{GNP}}$$

This indicator shows the economic growth of higher education relative to that of the entire economy. As an extension of this notion, I suggest displaying the real rate of change in expenditures for higher education. This can be shown by deflating the overall rate of change in expenditures using the Higher Education Price Index (HEPI) as a deflator

$$\frac{\text{Expenditures in year T - Expenditures in year T-1}}{\text{HEPI in year T - HEPI in year T-1}}$$

As another means of putting higher education in an economic context, one can show the relationship between HEPI and the Consumer Price Index (CPI). While this relationship could be expressed as a ratio between the two indexes, I suggest both trend lines be presented on the same grid as a more easily understood alternative.

3. Political Context

The political context for higher education is reflected in the opinions of the general public and in the relative priority assigned to higher education in the allocation of resources by lawmakers, particularly state-level legislators.

The status of higher education in the eyes of the general public is reflected in poll information such as that gathered by Group Attitudes Corporation in cooperation with the Council for the Advancement and Support of Education and expected to be gathered in the future by Opinion Research Corporation. This survey has been completed for years 1982, 1983, and 1984. It will be extended to 1985 and probably beyond. The survey addresses questions such as perceptions of the quality of a college education, of the importance of different educational functions, of the costs of higher education and the ability of people to meet these costs, and of state and federal support of higher education. Trends in response to such questions are important indicators of popular support for higher education.

Legislative support can be imputed from data concerning the priorities given to higher education as reflected in state appropriation data. This kind of support can be assessed in two ways. First, by calculating support for higher education as a proportion of all state appropriations:

$$\frac{\text{General fund appropriations for higher education}}{\text{All general fund appropriations}}$$

These data are available from the Census Bureau. As an alternative, state appropriations for higher education are compiled in Higher Education Financing in the Fifty States.

A second approach to this same general kind of indicator would relate higher education appropriations to state tax capacity:

$$\frac{\text{Total state appropriations to higher education}}{\text{State tax capacity}}$$

The numerator is the same as the prior formulation. The methodology for calculating state tax capacity has been developed by the Advisory Commission on Intergovernmental Relations, but there are no current data available. Periodically calculating state tax capacity would be a worthwhile endeavor.

Since these latter two constructs must be done on a state-by-state basis, an indicator can be constructed around the proportions of states for which the ratios increased, decreased, or remained constant.

D. Summary

If we revisit the organizing framework presented in section II of this document and fill in the blanks, one is left with the following general schema of higher education indicators:

A. Outcomes

1. Student Outcomes

a. Student Performance - Knowledge, Skills, and Values Outcomes

- No knowledge/skills indicators recommended at this time (GRE/Verbal and Quantitative scores as a last resort)
- Changes in values and attitudes developed from follow-up CIRP data

b. Behavioral/Relational Outcome Measures

- Retention rates
- Program completions--degrees granted
- Transition rates to graduate schools (by field)
- Employment rates by level of education
- Proportion of graduating class underemployed
- Starting salaries
- Median incomes of college graduates relative to median incomes of high school graduates

2. Discipline/Research Outcomes

- U.S. proportion of the world's science and technology articles
- Relative citation ratios for U.S. articles
- U.S. international transactions in royalties and fees

3. Economic/Societal Outcomes

- Underemployment of college graduates

4. Civic/Societal Outcomes

B. Resources

1. Institutions

- Proportion of institutions in each sector
- Proportion of FTE students in each sector
- Proportion of institutions in which proportion of funds received from governments at all levels has increased, decreased, or remained constant

2. Programs and Curricula

- Proportion of degrees awarded in arts and sciences vs. vocational and professional programs
- Proportion of degrees granted by major programmatic grouping
- Concentration of degrees granted by field

3. Financial Resources

- Proportion of institutional revenues from primary sources
- Patterns of state vs. student funding in public institutions
- Expenditures by function
- Expenditures for student related programs as a proportion of total current fund expenditures
- Expenditures for scholarships and fellowships as a proportion of tuition revenue
- Educational costs per FTE student
- Tuition Price Index
- Tuition price changes in relation to changes in personal disposable income
- Proportions of funds from primary sources utilized by students
- Funds from parents, spouse, and self as proportion of total student funds
- Loans as a proportion of total funds

4. Human Resources

- Tenure status of faculty

5. Physical Resources

- Replacement rate of buildings
- Replacement rate of equipment

C. Contexts

1. Demographic Context

- Participation rate
- First-time freshmen as a proportion of high school graduates
- ACT and SAT scores
- Academic rank of incoming freshmen
- FTE/headcount ratio
- Student choice (by type of institution)
- Student choice patterns of academically most able students

2. Economic Context

- Total expenditures on higher education as a proportion of GNP
- Real rate of change of expenditures on higher education
- Ratio of Higher Education Price Index (HEPI) to CPI

3. Political Context

- Public opinion results
- State appropriations for higher education as a proportion of total state appropriations
- State appropriations for higher education as a proportion of state taxing capacity

IV. IMPLICATIONS FOR DATA COLLECTION

A review of the summary at the end of the previous section clearly reveals the areas in which data are reasonably adequate and those in which they are not. The most obvious gap is that dealing with outcomes data regarding student performance. For all intents and purposes there are no usable data regarding general knowledge and skills outcomes. As indicated, there are instruments available that generate data of this kind, but they are not in sufficiently widespread use to support the development of national level indicators. Among these are the ACT-COMP and the ETS Undergraduate Assessment Program (UAP), currently discontinued but likely to reemerge. Likewise, the National Assessment of Education Progress (NAEP) could be conducted much more regularly for the young adults (age 25) group and distinctions made for individuals having different levels of academic preparation. The latter would likely be the least controversial avenue to follow. NAEP is not institution specific so there is no likelihood of unfavorable comparison. More important, however, NAEP's selection of items is independent of any particular curriculum. It is--or could be shaped to be--a national exam for national purposes. The other instruments are devised much more for institutional purposes.

With regard to data about values and attitudes outcomes as well as data about some of the characteristics of students important in describing participation and choice (age, income, ability), CIRP is by far the best alternative. CIRP data could be made more useful if:

1. Senior surveys were a regular, ongoing component of the program.

2. The sample could be made nationally representative using the NCES institutional classification scheme.

3. The deficiencies occasioned by the omission of part-time students could be overcome.

The behavioral/relationship outcomes measures are less underdeveloped. Still, this area would be extended enormously by the regular (every three years or so) initiation of a new cohort in a series such as HSB. Through such a series, the important transitions can be tracked in a much more fruitful way. Further, the ability to regularly calculate economic outcomes (whether on the basis of rate of return or the simpler comparison of expected lifetime earnings for different levels of academic preparation) would be an important addition.

The resource measures, those on which NCES has focused for many years, are much more fully developed. Many of the weak spots will be strengthened with the advent of IPEDS. Specific reference is made to having student credit hour data and, more importantly, more data about faculty (particularly data about part-time faculty) and other staff. Nevertheless, significant holes remain. Even with IPEDS, data about faculty will be far more limited than would be desirable. The biggest void is valid and reliable data about student aid--the sources and the characteristics of students receiving it.

In summary, there remain some significant gaps, gaps that must be filled if we are to be in a position to have a complete set of higher education indicators. Many more gaps must be filled if the framework presented here is to be applied to the broader context of postsecondary education. Nevertheless, there is certainly enough material available to make a significant step forward in generating information that is relevant and important to policy discussion surrounding higher education.

References

Adelman, Clifford. The Standardized Test Scores of College Graduates 1964-1982. Washington, D.C.: U.S. Government Printing Office, 1985.

Advisory Commission on Intergovernmental Relations. 1981 Tax Capacity of the Fifty States. Washington, D.C.: U.S. Government Printing Office.

Astin, Alexander W., et al. The American Freshman: National Norms for Fall 1984. Los Angeles, Calif.: University of California, 1984.

Bauer, Raymond A. Social Indicators. Cambridge, Mass.: The MIT Press, 1966.

Bowen, Howard R. Investment in Learning. San Francisco: Jossey-Bass, 1977.

Brinkman, Paul T. Higher Education Financing: 1973-1980. Boulder, Colo.: National Center for Higher Education Management Systems [NCHEMS], 1983.

Brown, Maryann K.; Kahl, Stuart; and Kriz, Kaye. Higher-Education Indicators: Tuition, Room, and Board. Boulder, Colo.: NCHEMS, 1982.

Campbell, Angus, and Converse, Philip E. The Human Meaning of Social Change. New York: Russell Sage Foundation, 1972.

Correa, Hector (Ed.) Analytical Models in Educational Planning and Administration. New York: McKay Company, 1975.

Denison, E. F. "The Source of Economic Growth in the United States and the Alternates Before Us." (Supplementary Paper No. 13). New York: Committee for Economic Development, 1962.

Denison, E. F. Measuring the Contribution of Education, and the Residual, to Economic Growth. The Residual Factor and Economic Growth. Paris: Organization for Economic Cooperation and Development, 1964.

Duncan, Otis D. "Toward Social Reporting: Next Steps." Social Science Frontier, No. 2. New York: Russell Sage Foundation, 1969.

Eckaus, R. S. Estimating the Returns to Education: A Disaggregated Approach. Berkeley: The Carnegie Commission on Higher Education, 1973.

Ewell, Peter T. The Self-Regarding Institution: Information for Excellence. Boulder, Colo.: NCHEMS, 1984.

Executive Office of the President, Council of Economic Advisors. Economic Indicators. Washington, D.C.

Gooler, Dennis. "The Development and Use of Social Indicators." Proceedings of the 1975 ETS Invitational Conference, Educational Indicators: Monitoring the State of Education. Princeton, NJ: ETS, 1975.

Group Attitudes Corp. American Attitudes Toward Higher Education. New York, 1982.

Jones, Dennis P. Data and Information for Executive Decisions in Higher Education. Boulder, Colo.: NCHEMS, 1982.

Land, Kenneth. "Social Indicator Models: An Overview." Social Indicator Models, Land and Spilerman. New York: Russell Sage Foundation, 1975.

McCoy, Marilyn, and Halstead, D. Kent. Higher Education Financing in the Fifty States: Interstate Comparisons Fiscal Year 1982 (4th ed.). Boulder, Colo.: NCHEMS, 1984.

National Center for Education Statistics. Indicators of Education Status and Trends. Washington, D.C.: U.S. Department of Education, 1985.

National Institute of Education. Inflation Measures for Schools and Colleges. Washington, D.C.: U.S. Department of Education, 1983.

National Science Board, National Science Foundation. Science Indicators 1982. Washington, D.C.: U.S. Government Printing Office, 1983.

O'Neill, Dave M., and Sepielli, Peter. Education in the United States: 1940-83. Census Bureau. Washington, D.C.: U.S. Government Printing Office, 1985.

O'Neill, June. Resource Use in Higher Education--Trends in Outputs and Inputs, 1930-1967. (Carnegie Commission on Higher Education Report). New York: McGraw-Hill, 1972.

Psacharopoulos, G., and Hinchliffe, K. Returns to Education, An International Comparison. San Francisco: Jossey-Bass, 1973.

Sheldon, Eleanor B. "The Social Indicators Movement." Proceedings of the 1975 ETS Invitational Conference, Educational Indicators: Monitoring the State of Education. Princeton, NJ: ETS, 1975.

Sheldon, Eleanor B., and Freeman, Howard E. "Notes on Social Indicators: Promises and Potential." Policy Sciences, April 1970.

Tierney, Michael. Trends in College Participation Rates. Boulder, Colo.: NCHEMS, 1982.

Volkwein, J. R. "State Financial Control, Practices and Public Universities: A National Study." Paper presented at the annual meeting of the Association for the Study of Higher Education, Chicago, March, 1984.

Appendix A

Form of Dispersion Statistic for Categorical Data

$$\text{Dispersion} = \frac{-\sum_{i=1}^{n} p_i \log p_i}{-\sum_{i=1}^{n} \frac{1}{n} \log \frac{1}{n}}$$

where n = the number of categories

p_i = proportion of cases in the i-th category

This quantity varies from zero (no diversity - one category has all the events and the rest have none) to one (the proportion of cases is equal for all categories).